

CLAIMS:

1. An arithmetic unit for adding a plurality of values, each value falling within the range  $-2^{N-1}$  to  $2^{N-1}-1$ , to define a result,  
 5 said arithmetic unit comprising:  
     an input for receiving said plurality of values;  
     an adder for adding said plurality of values to define a result, said result being within a first range  $-2^N$  to  $2^N-1$ ;  
     a detector for determining if said results fall within a  
 10 second range  $-2^{N-1}$  to  $2^{N-1}-1$ , said second range being smaller than the first range, said detector being arranged to consider only some of the bits of said result; and  
     circuitry for modifying said result in so that the result output by said arithmetic unit falls within the second range; and  
 15 circuitry for performing a round on the result.
2. A unit as claimed in claim 1, wherein three values are added together.
- 20 3. A unit as claimed in claim 1, wherein said adder comprises a carry save adder stage.
4. A unit as claimed in claim 2, wherein said carry save adder stage comprises a plurality of 3 to 2 carry save adders.
- 25 5. A unit as claimed in any of claims 1, wherein said adder comprises an adder stage for providing said result.
6. A unit as claimed in claim 1 wherein said detector is  
 30 arranged to take into account the bits other than the considered bits.
7. A unit as claimed in claim 1, wherein the second range can be expressed by N bits and bits N to N-2 of at least some of the  
 35 plurality of values are considered by said detector.

8. A unit as claimed in claim 1, wherein the arithmetic unit is arranged to operate in 2's complement binary arithmetic.

5 9. A unit as claimed in claim 8, wherein a first of said plurality of values has an N bit format and falls in the range  $-2^{N-1}$  to  $2^{N-1}-1$ .

10 10. A unit as claimed in claim 8, wherein the sum of a second and a third of said plurality of values falls in the range  $-2^{N-1}$  to  $2^{N-1} + 2^{(N/2-1)}$ .

11. A unit as claimed in claim 8, wherein said first range is  $-2^N$  to  $2^N + 2^{(N/2-1)}-1$  and said second range is  $-2^{N-1}$  to  $2^{N-1}-1$ .

12. A unit as claimed in claim 1 wherein if it is determined that the result falls outside said second range, the result is replaced by a saturation value.

13. A unit as claimed in claim 12, wherein a first saturation value is provided if one end of the range is exceeded and another saturation value is provided if the other end of the range is exceeded.

14. A unit as claimed in claim 2, wherein at least one of the following values is calculated;

a first carry value is generated from bits N-2 from said three values;

a second carry value is generated from the bits N-1 of said three values;

a first sum value is generated from the bits N-1 of said three values; and

a second sum is generated from the bits N of two of said values and bit N-1 of one of the values.

15. A unit as claimed in claim 14, wherein said first and second carry values and said first and second sums are generated to provide first and second result values.

5 16. A unit as claimed in claim 15, wherein it is determined by said detector that if the second range is exceeded based on said first and second results and a third carry value.

10 17. A unit as claimed in claim 16, wherein said third carry value is determined from an addition of a sum and a carry value for bits N-2 down to 0 of said values

18. A unit as claimed in claim 1 wherein the round is performed to clear the x least significant bits of said result.

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19. A unit as claimed in claim 1, wherein the round is performed by adding  $2^{(N/2)-1}$  to said result.

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20. A unit as claimed in claim 1, wherein said circuitry for modifying said result is arranged to receive information as to the sign of the total of a first and a second value and information as to one bit of a third value to determine if the result can fall out of said second range at the positive end thereof or the negative end thereof.

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21. A unit as claimed in claim 1, wherein said plurality of values comprise a plurality of partial products.

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22. A unit as claimed in claim 1, wherein said plurality of values comprise an accumulator.

23. A unit as claimed in claim 1, wherein a plurality of registers are provided for storing said plurality of values.

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